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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/939,848	08/27/2001	Guy T. Blalock	3578 . 1US (92-555.1)	3166

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TRASK BRITT
P.O. BOX 2550
SALT LAKE CITY, UT 84110

EXAMINER

LEURIG, SHARLENE L

ART UNIT	PAPER NUMBER
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2879

DATE MAILED: 09/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/939,848

Applicant(s)

BLALOCK ET AL.

Examiner

Sharlene Leurig

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed on June 30, 2003 has been entered and acknowledged by the Examiner. Claims 1, 7, 11 and 19 have been amended.

Information Disclosure Statement

2. The signed second sheet of the information disclosure statement (IDS) submitted on August 27, 2001 is included in the outgoing action.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 3, 4, 9, 10, 14, 15, 16, 22, 23 and 24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 16 and 24 include the limitation of a field emission array and field emission display, respectively, which are final products, having the added limitation of "redeposition material adjacent at least a portion of the periphery" of the pointed tip. The specification discloses the redeposition material only in relation to the intermediate product resulting from the method step of the facet etch, which results in redeposition

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material consisting of waste products of the etched surfaces. Such material collected around the periphery in the final product would suppress emission and is therefore unwanted in the final product. Since the specification does not expressly state the presence of redeposition material in the final product and only expressly states the removal of the redeposition material (paragraph 0034), the redeposition material is interpreted as being an intermediate product, and is therefore not enabled in the final product.

Claims 3, 4, 9, 10, 14, 15, 22 and 23 include the limitation of the apex comprising a low work function material. However, the specification does not disclose the vertical sidewalls of the structure being made of low work function material, but instead being formed of conductive material so that the straight column portion and the tip portion are made of two different materials with a discernable boundary in between, as shown in Figures 9 and 15. Therefore the specification is not enabling for a field emission tip having a substantially vertical sidewall portion and an inclined sidewall portion with no discernable boundary between them when the inclined sidewall portion, which includes the apex, comprises a low work function material.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

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2. Claims 1-18 stand rejected under 35 U.S.C. 102(a) as being anticipated by Hobart et al. (6,201,342) (of record).

Regarding claim 1, Hobart discloses a field emission tip with a structure comprising at least one of a semiconductive material and a conductive material (column 3, lines 21-48), also having a periphery with a vertical sidewall portion (Figure 1, element 14) and an apex (18) at the top of the structure.

Regarding the new limitation of claims 1, 7 and 11, Hobart discloses a field emission tip comprising a substantially vertical sidewall (nanomesa) (14) and an inclined sidewall (tip) (16), which may be of the same material as the nanomesa (column 6, lines 40-41). Hobart further discloses that the tips have a smooth surface and the field emitters are uniform (column 8, lines 25-32). "Discernable" is defined as "to recognize or identify as separate and distinct" and "boundary" is defined as "the line or plane indicating the limit or extent of something". Since the tips can be formed of the same material as the nanomesas and are smooth and uniform, the boundary between the nanomesa and the tip would not be discernable.

Regarding claim 2, Hobart discloses a height of the vertical sidewall portion exceeding the width of the structure (Figure 1, element 14).

Regarding claims 3, 9 and 14, Hobart discloses an apex comprising a low work function material (column 8, lines 47-49).

Regarding claims 4, 10 and 15 the low work function material is selected from the group comprising aluminum titanium silicide, titanium silicide nitride, titanium nitride, tri-chromium mono-silicon, and tantalum nitride (column 3, lines 21-48).

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Regarding claims 5-8 and 17-18, the apex has a lateral width of less than 100 nm and 50 nm (column 7, lines 62-63).

Regarding claim 11, Hobart discloses a field emission array with a substrate (Figure 1, element 12), and at least a portion of the periphery (14) oriented perpendicularly relative to the substrate, and all the limitations discussed above.

Regarding claim 12, a portion of the periphery (14) is adjacent the substrate.

Regarding claim 13, the height of a portion of the periphery (14) relative to the substrate exceeds a width of substantially pointed tip (column 3, lines 49-57).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 19-26 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Hobart et al. (6,201,342) (of record) in view of applicant's admission of the prior art.

Regarding claim 19, Hobart discloses a field emission display with all the limitations discussed above including an anode display screen (24), a cathode spaced apart from the anode display screen, the cathode including a substrate (Figure 1, element 12), a pointed tip (18) comprising at least one of a semiconductive material and a conductive material, at least one pointed tip including a periphery (14), at least a portion of the periphery oriented substantially perpendicularly relative to the substrate,

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and a gate layer (20) through which the pointed tip is exposed, and a voltage source associated with the anode display screen, the gate, and the cathode to provide a potential difference between the cathode and the gate and between the cathode and the anode display screen (Figure 1, voltage elements).

Regarding the new limitation of claim 19, Hobart discloses a field emission tip comprising a substantially vertical sidewall (nanomesa) (14) and an inclined sidewall (tip) (16), which may be of the same material as the nanomesa (column 6, lines 40-41). Hobart further discloses that the tips have a smooth surface and the field emitters are uniform (column 8, lines 25-32). "Discernable" is defined as "to recognize or identify as separate and distinct" and "boundary" is defined as "the line or plane indicating the limit or extent of something". Since the tips can be formed of the same material as the nanomesas and are smooth and uniform, the boundary between the nanomesa and the tip would not be discernable.

Regarding claim 20, a portion of the periphery (14) is adjacent the substrate.

Regarding claim 21, the height of a portion of the periphery (14) relative to the substrate exceeds a width of substantially pointed tip (column 3, lines 49-57).

Regarding claim 22, Hobart discloses a top portion of the pointed tip comprising a low work function material (column 8, lines 47-49).

Regarding claim 23, the low work function material is selected from the group comprising aluminum titanium silicide, titanium silicide nitride, titanium nitride, tri-chromium mono-silicon, and tantalum nitride (column 3, lines 21-48).

Regarding claims 25 and 26, the apex has a diameter of less than 100 nm and 50 nm (column 7, lines 62-63).

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Hobart lacks explicit disclosure of a vacuum between the anode and the cathode.

It is well known in the art to provide a vacuum between the anode and the cathode in a field emission device.

The applicant's admission of the prior art teaches a vacuum between the anode and the cathode (page 2, paragraph 0004, line 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Hobart's field emission array with a vacuum in between the anode and the cathode to provide a flat display device to enhance emission.

Response to Arguments

5. Applicant's arguments filed on June 30, 2003 have been fully considered but they are not persuasive.

The applicant traversed the rejection of claims 16 and 24 under the first paragraph of 35 U.S.C. 112, arguing that the specification discloses "at least one method for making and using a field emission array having redeposition material" and quoting paragraphs 31, 33 and 34 of the specification.

The specification discloses the redeposition material only in relation to the intermediate product resulting from the method step of the facet etch (paragraphs 0031, 0033 and 0034), which results in redeposition material consisting of waste products of the etched surfaces. Such material collected around the periphery in the final product would suppress emission and is therefore unwanted in the final product. Since the specification does not expressly state the presence of redeposition material in the final product and only expressly states the removal of the redeposition material (paragraph

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0034), the redeposition material is interpreted as being an intermediate product, and is therefore not enabled in the final product.

The applicant traversed the rejection of claims 1-26 under 35 U.S.C. 102 and 103, arguing that Hobart discloses a tip grown on a nanomesa (page 12, fourth paragraph), and therefore fails to teach or suggest a field emitter having no discernable boundary between the column and the tip portion (paragraph 6, page 12). The applicant admits that Hobart discloses that the nanomesa and the tip may be made of the same material (paragraph four).

Hobart discloses that the tips have a smooth surface and the field emitters are uniform (column 8, lines 25-32). "Discernable" is defined as "to recognize or identify as separate and distinct" and "boundary" is defined as "the line or plane indicating the limit or extent of something". Since the tips can be formed of the same material as the nanomesas and are smooth and uniform, the boundary between the nanomesa and the tip would not be discernable, whether formed from epitaxial self-growth as disclosed by Hobart or by etching as disclosed by the applicant. Therefore the reference of Hobart does not require the applicant's admitted prior art for rejection of the claim limitations of the vertical sidewall and an inclined sidewall having no discernable boundary between them.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

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§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sharlene Leurig whose telephone number is (703)305-4745. The examiner can normally be reached on Monday through Friday, 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (703)305-4794. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Sharlene Leurig
August 26, 2003


VIP PATEL
PRIMARY EXAMINER